



ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (H) Electronics						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
I	32515919	Artificial Intelligence	4		2	6
Teacher/Instructor(s)		Dr. Nisha Jha				
Session		2021-22				

Course Objective:

Artificial Intelligence is a major step forward in how computer system adapts, evolves and learns. It has widespread application in almost every industry and is considered to be a big technological shift, similar in scale to past events such as the industrial revolution, the computer age, and the smart phone revolution. This course will give an opportunity to gain expertise in one of the most fascinating and fastest growing areas of Computer Science through classroom program that covers fascinating and compelling topics related to human intelligence and its applications in industry, defence, healthcare, agriculture and many other areas. This course will give the students a rigorous, advanced and professional graduate-level foundation in Artificial Intelligence.

Course Learning Outcomes:

- Build intelligent agents for search and games
- Solve AI problems through programming with Python
- Learning optimization and inference algorithms for model learning
- Design and develop programs for an agent to learn and act in a structured environment

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	Introduction to Python: Introduction, Overview of Programming, Introduction to Python, Creating Python Programs	1-2	Concept of AI, history, current status, scope, agents, environments,
		3-4	Problem Formulations, Review of tree and graph structures,
		5-6	State space representation, Search graph and Search tree.
		7-8	Structure of a Python Program, Elements of Python
		9-10	Python Interpreter, Using Python as calculator,

			Python shell,
		11-12	Indentation. Atoms, Identifiers and keywords, Literals, Strings
		13-14	Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment,
		15-16	Operator, Ternary operator, Bit wise operator, Increment or Decrement operator), Input and Output Statements,
		17-18	Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.),
		19-20	Defining Functions, default arguments, Errors and Exceptions.
2.	Iteration and Recursion and Strings and Lists	21-22	Conditional execution, Alternative execution,
		23-24	Nested conditionals, The return statement, Recursion,
		25-26	Stack diagrams for recursive functions, Multiple assignment,
		27	The while statement, Tables, Two-dimensional tables
		28-29	String as a compound data type, Length, Traversal and the for loop,
		30	String slices, String comparison, A find function,
		31	Looping and counting, List values, Accessing elements,
		32	List length, List membership, Lists and for loops,
		33-34	List operations, List deletion. Cloning lists, Nested lists
3.	Object Oriented Programming and Search Algorithms	35	Introduction to Classes, Objects and Methods,
		36-37	Standard Libraries, Random search,
		38	Search with closed and open list,
		39-40	Depth first and Breadth first search,
		41	Heuristic search,
		42-43	Best first search, A* algorithm,
		44	Game Search
4.	Probabilistic Reasoning, Markov Decision process and Reinforcement Learning	45	Probability, conditional probability, Bayes Rule,
		46-47	Bayesian Networks- representation, construction and inference,
		48	Temporal model, hidden Markov model.
		49-50	MDP formulation, utility theory,
		51-52	utility functions, value iteration,
		53-54	policy iteration and partially observable MDPs.
		55-56	Passive reinforcement learning,
		57-58	direct utility estimation, adaptive dynamic programming, temporal difference learning,
		59-60	Active reinforcement learning- Q learning.

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		
	• Class Test		
	• Attendance		
	• Assignment		
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	Contents	Contact Hours
1	<p>Introduction to Python</p> <p>Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.</p> <p>Overview of Programming: Structure of a Python Program, Elements of Python</p> <p>Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator)</p> <p>Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.</p>	20
2	<p>Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions, Multiple assignment, The while statement, Tables, Two-dimensional tables</p> <p>Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists</p>	14
3	<p>Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries</p> <p>Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.</p>	10
4	<p>Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.</p> <p>Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.</p>	16

	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.	
	Total	60
Suggested Books:		
Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall	
2.	Artificial Intelligence, Elaine Rich and Kevin Knight, Tata McGraw Hill	
3.	A Classical Approach to Artificial Intelligence, Trivedi, M.C., Khanna Publishing House, Delhi.	
4.	Artificial Intelligence, Saroj Kaushik, Cengage Learning India,	2011
5.	Artificial Intelligence: Foundations for Computational Agents, David Poole and Alan Mack worth, Cambridge University Press	2010
Mode of Evaluation:		Internal Assessment / End Semester Exam 25/75

Progress Report:

Unit No.	Learning Objective	Dates.	Topics to be covered
1.	Introduction to Python: Introduction, Overview of Programming, Introduction to Python, Creating Python Programs		Concept of AI, history, current status, scope, agents, environments,
			Problem Formulations, Review of tree and graph structures,
			State space representation, Search graph and Search tree.
			Structure of a Python Program, Elements of Python
			Python Interpreter, Using Python as calculator, Python shell,
			Indentation. Atoms, Identifiers and keywords, Literals, Strings
			Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment,
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		Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break,	

			continue and pass.),
			Defining Functions, default arguments, Errors and Exceptions.
2.	Iteration and Recursion and Strings and Lists		Conditional execution, Alternative execution,
			Nested conditionals, The return statement, Recursion,
			Stack diagrams for recursive functions, Multiple assignment,
			The while statement, Tables, Two-dimensional tables
			String as a compound data type, Length, Traversal and the for loop,
			String slices, String comparison, A find function,
			Looping and counting, List values, Accessing elements,
			List length, List membership, Lists and for loops,
		List operations, List deletion. Cloning lists, Nested lists	
3.	Object Oriented Programming and Search Algorithms		Introduction to Classes, Objects and Methods,
			Standard Libraries, Random search,
			Search with closed and open list,
			Depth first and Breadth first search,
			Heuristic search,
			Best first search, A* algorithm,
		Game Search	
4.	Probabilistic Reasoning, Markov Decision process and Reinforcement Learning		Probability, conditional probability, Bayes Rule,
			Bayesian Networks- representation, construction and inference,
			Temporal model, hidden Markov model.
			MDP formulation, utility theory,
			utility functions, value iteration,
			policy iteration and partially observable MDPs.
			Passive reinforcement learning,
			direct utility estimation, adaptive dynamic programming, temporal difference learning,
		Active reinforcement learning- Q learning.	